

ETSI TS 102 973 V1.1.1 (2008-09)

Technical Specification

Access Terminals, Transmission and Multiplexing (ATTM); Network Termination (NT) in Next Generation Network architectures

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Full standard:
<https://standards.iteh.ai/catalog/standards/sist/888e8cad-20fa-423f-8fc5-28ade9e003a9/etsi-ts-102-973-v1.1.1-2008-09>



Reference

DTS/ATTM-02004

Keywords

access, network

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2008.
All rights reserved.

DECT™, PLUGTESTS™, UMTS™, TIPHON™, the TIPHON logo and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

Contents

Intellectual Property Rights	4
Foreword.....	4
Introduction	4
1 Scope	8
2 References	8
2.1 Normative references	8
2.2 Informative references	9
3 Abbreviations	10
4 General requirements	11
4.1 Hardware and case characteristics.....	11
4.2 Powering characteristic	12
4.3 Electrical and Mechanical Protection, Safety, EMC and Environmental Safety (Eco-Compatibility).....	13
5 WAN physical interfaces.....	14
5.1 xDSL physical connector	14
5.2 ADSL2+ specific characteristics	14
5.3 VDSL2-only specific characteristics	15
5.4 VDSL2 and ADSL2+ specific characteristics.....	16
5.5 GPON-specific characteristics.....	16
5.6 Point-to-point FTTH specific characteristics	17
6 WAN interfaces logical framing	18
6.1 L2 ATM features.....	18
6.2 L2 Ethernet features	18
6.3 Performances.....	19
7 LAN interfaces	19
7.1 Single LAN port	19
7.2 Multiple LAN ports	19
8 IP functionalities	20
8.1 IP traffic generated inside the NT for communication with the network	20
8.2 IP traffic between LAN and WAN.....	20
9 LAN-WAN QoS functionalities.....	21
10 Security.....	22
11 Management	22
11.1 Remote physical layer monitoring capabilities.....	22
11.2 Local management and configuration	23
11.3 TCP/IP based remote management	24
11.4 Alternative management solution for Point-to-Point FTTH.....	25
11.5 Remote management in optical networks (GPON)	26
11.6 Physical alarms.....	26
12 Memory requirements related to firmware upgrade feature.....	27
13 Factory default configuration	27
Annex A (informative): Bibliography.....	28
History	29

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM).

Introduction

The present document defines the requirements of a Network Termination (NT) device for Next Generation Access Networks in different technologies.

Because many options for such a device are feasible, depending on the access network technology, the business scenario, the regulatory constraints, etc., the present document provides a superset of the requirements for a Layer 2 Network Termination: a specific NT device implementation may be derived by selecting the appropriate subset of technical requirements.

The present document is organized as a list of possible clauses for a joint specification to be used as Request for Information and to extract contributions to be submitted to different Fora and Standardization bodies.

Business Rationale

As the next step in the evolution of Access Networks, it is foreseen that higher bandwidth services will be delivered, either with active network elements built closer to the end-user (e.g. VDSL or Point-to-Point FTTH technology), or at the opposite end with active elements more distant from the end-user (e.g. GPON FTTH technology). Due to the deployment of new access networks, network operators are faced with technological, operational, financial and also regulatory challenges.

The development of a Layer-2 Network Termination (NT) device at the customer premises location for Next Generations Networks is related with the deployment of new very high broadband network access infrastructure and the need to ensure a competitive market for retail services. Since the investment for those deployments is very high, it is expected that only a very limited number of operators can build the infrastructure.

For this reason, in deployment scenarios where the investment in (part of) the infrastructure has geographically only been made by a single Access Network Provider (ANP), a wholesale offer like "Ethernet Bitstream" will contribute to create a competitive market for retail services. This will allow more Service Providers to offer services to end users through a standard and unique Access Network-Home Network interface (Ethernet interface). The Ethernet Bitstream offering can be considered as a Layer-2 transport service from the end-user location to the Point of Presence (PoP) of the Broadband Service Provider (BSP), as an alternative to sub-loop unbundling. Then the BSP supplies the end user IP connectivity and optionally application services of its own or of other application service providers (ASP). At the contrary, in deployment scenarios where several companies have invested in broadband network access infrastructure in a given geographical area, retail services competition is provided by sub-loop unbundling and therefore wholesale offer like "Ethernet Bitstream" is not required.

The following scenarios can be considered:

- 1) **Multiple access network providers in a given area/Single network operator per customer:** each access network is owned by an operator offering its own bundle of services; the customer can churn from one operator to another.
In this scenario the NT is not strictly mandatory as a stand-alone device. The operator can provide an integrated CPE device (Home Gateway) to its customer in order to terminate the xDSL or fiber optic link and to deliver its services.
- 2) **Single access network provider in a given area/Multiple BSP per customer:** this scenario refers to a single open access network, owned by an ANP, providing open and equal access to many BSP that may simultaneously offer services to each customer via multiple virtual Ethernet connections.
In this scenario the presence of the NT owned by the ANP is mandatory. The NT provides standard Ethernet multi-port interface(s) to the BSPs, with one (or more) different port(s) for each BSP. Each BSP can provide terminals (Home Gateway, Analogue Telephony Adapters, VoIP phones, IPTV Set Top Box) to its customer in order to deliver its services.

In any case, the deployment of a NT with standard Ethernet interface enables the definition of service models where other Customer Premises Equipment (CPE) and terminals are provided by the BSP or alternatively can be purchased on the retail market by the customer.

Both scenarios have a different impact on the requirements of the NT, but it is expected that having a NT device would:

- define a clear interface to allow the separation of responsibilities between the BSP and the ANP;
- help an ANP, providing wholesale services, to troubleshoot directly the end point of the access network at the NT-side, allowing end-to-end service assurance on the NGAN;
- allow the evolution of home networks and all IP-based services independently from the FTTx access network technology.

However, since the NT is a L2 device, in case of multi-BSP-per-customer there are the following limitations:

- a separate IP home subnetwork corresponds to each different BSP offering, so the customer cannot benefit from a single home network, and interaction between services of different broadband service providers are impossible within the home network;
- internal home network cabling becomes increasingly complex, if differentiation of broadband service providers is made through different physical interfaces;
- the ANP needs to strictly isolate each BSP L2 flow, and cannot benefit from statistical multiplexing on the local (sub)loop and on the aggregation network.

In conclusion, the multi-BSP-per-customer scenario provides the following features:

- free choice for the customer to compose its own bundle of services from different BSPs;
- separation of responsibilities between the ANP investing in the infrastructure (responsible of the access network, including the NT) and the different BSPs (responsible of the home network and the services provided to the end customer).

Figure 1 describes the reference architecture related to the use of a Network Termination device with standard Ethernet interface and different CPEs at the customer site.

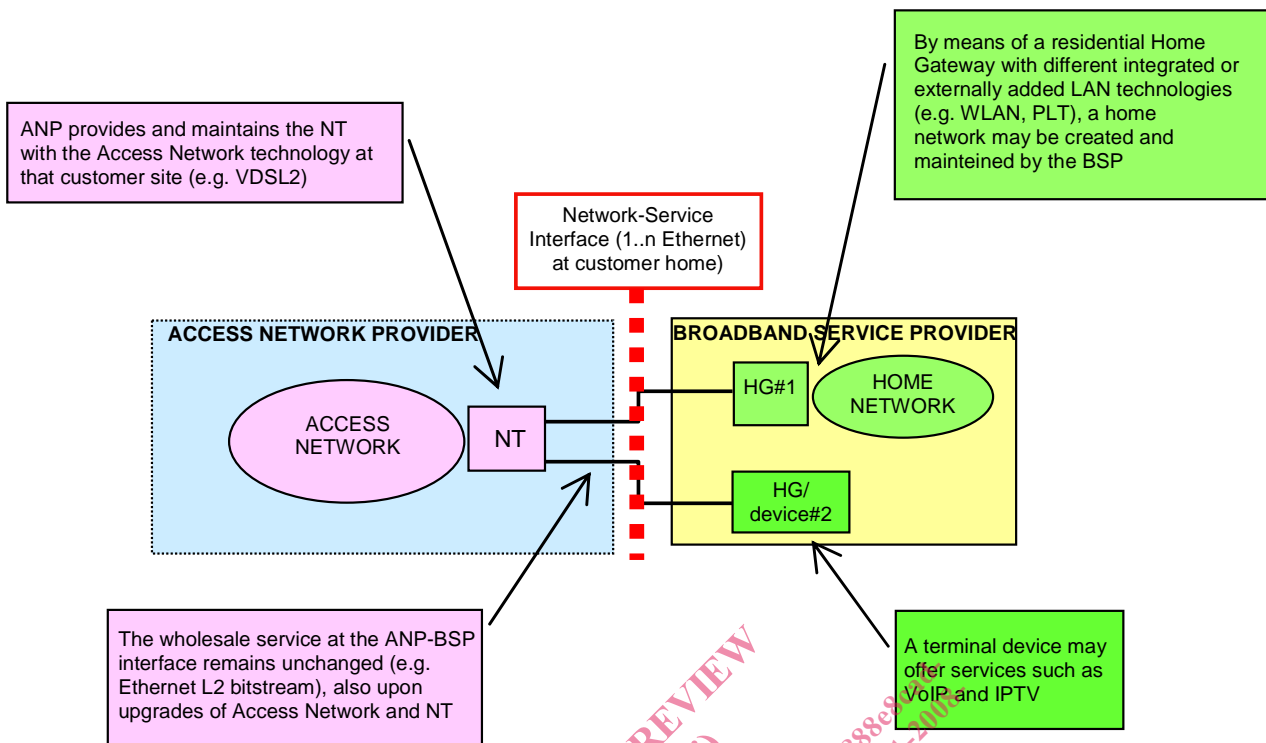


Figure 1: Reference architecture for use of a Network Termination in NGN

NT high-level functionalities

The main features of the NT device, that are defined in the present document, are:

- termination of the access network at the customer premise, whatever access technology is used (ADSL2+, VDSL2, GPON, Point-to-Point FTTH with 100Base-BX):
 - when existing twisted pair lines and VDSL2 technology is used in the access, NT is self-installing by the customer on the existing POTS/ISDN termination connector;
- it is locally powered;
- it is under complete ownership and responsibility of the ANP, for provisioning and assurance purposes; remote management of the NT is a possible feature;
- it is equipped with (at least) one standard LAN-technology Ethernet interface, for the interconnection to CPE/Home Gateways/Terminals provided by BSPs or ASPs;
- it may be equipped with more than one physical LAN Ethernet interface in order to enable multiple service devices and multi-BSP offerings;
- it supports VLAN traffic segregation and related functionalities;
- optionally, it may provide upstream QoS functionalities to enable L2 bitstream services; this feature is especially needed when there is a bottleneck in the upstream, more relevant in case of xDSL access;
- optionally, it may be remotely managed (firmware upgrade included).

The following functionalities are **not required** for the NT device:

- lifeline in case of power interruption;
- VoIP/FXS ports and related functionalities;
- any other LAN interfaces except Ethernet;

- in case of multiple-BSP scenario, the intra-LAN connectivity between devices connected to different BSPs (in this case, the communication between these devices will use the WAN interface and geographical network).

Such a NT device may support a wholesale business model for L2 bitstream services over the Next Generation Access Network.

Reference block diagram for NT

In the present document, the possible functionalities of the NT device are organized in a set of functional blocks, that may be included or not included in the device depending upon specific implementations and deployments.

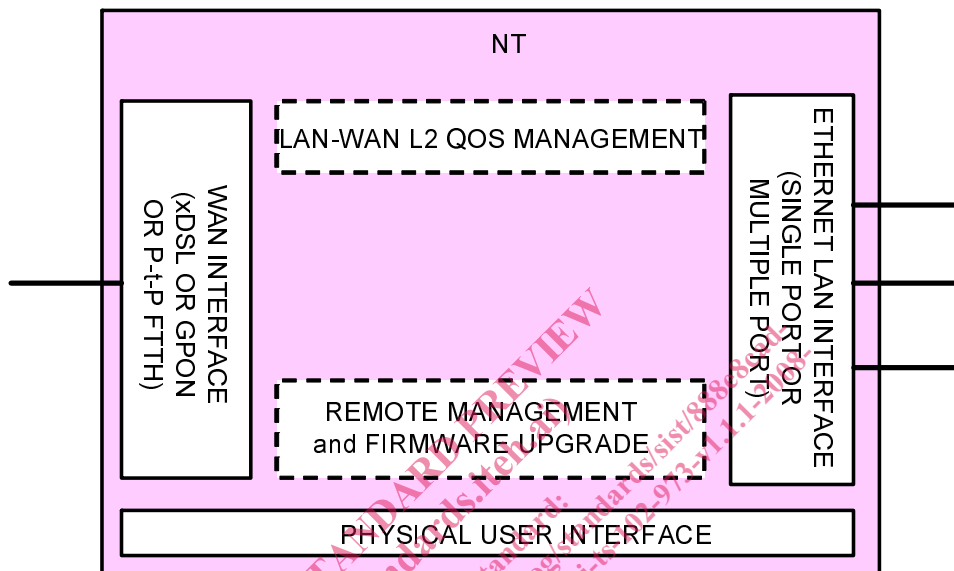


Figure 2: Reference block diagram for the Network Termination device

As outlined in figure 2, the functional blocks of the NT device are the following:

- **Physical user interface**, as defined in the general requirements of the NT device (clause 4), including LEDs and buttons/switches.
- **WAN physical interface** (clause 5), that must be either xDSL, GPON or Point-to-point FTTH. The logical framing on the WAN interface (clause 6) is L2 Ethernet, but in case of xDSL/ADSL2+ also ATM framing must be supported.
- **Ethernet LAN interface** (clause 7), that must be equipped with either a single LAN port (*single service provider scenario*) or with multiple LAN ports (*multiple service provider scenario*).
- IP functionalities (clause 8) are not required, except when a TCP/IP based remote management feature is requested.
- **LAN-WAN QoS functionalities** for the upstream traffic (clause 9), may be required, e.g. in case of VDSL2 NT with multiple LAN ports.
- The **remote management** functional block (clause 11) is optional and may be implemented with different solutions, depending upon the access technology on the WAN interface.

1 Scope

The present document describes a proposal of requirements for a Network Termination (NT) device in Next Generation Access Networks.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
 - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
 - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] CENELEC EN 50173-1 (2007): "Information technology - Generic cabling systems - Part 1: General requirements".
- [2] CENELEC EN 50173-4 (2007): "Information technology - Generic cabling systems - Part 4: Homes".
- [3] DSL Forum TR-124 (December 2006): "Functional Requirements for Broadband Residential Gateway Devices".

NOTE: Available at: www.dslforum.org/techwork/tr/TR-124.pdf.

- [4] DSL Forum TR-068 (May 2004): "Base Requirements for an ADSL Modem with Routing".

NOTE: Available at www.dslforum.org/aboutdsl/Technical_Reports/TR-068.doc.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.
- [i.2] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.
- [i.3] Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to Electrical Equipment designed for use within certain voltage limits.
- [i.4] Council Directive 93/68/EEC of 22 July 1993 amending Directives 87/404/EEC (simple pressure vessels), 88/378/EEC (safety of toys), 89/106/EEC (construction products), 89/336/EEC (electromagnetic compatibility), 89/392/EEC (machinery), 89/686/EEC (personal protective equipment), 90/384/EEC (non-automatic weighing instruments), 90/385/EEC (active implantable medicinal devices), 90/396/EEC (appliances burning gaseous fuels), 91/263/EEC (telecommunications terminal equipment), 92/42/EEC (new hot-water boilers fired with liquid or gaseous fuels) and 73/23/EEC (electrical equipment designed for use within certain voltage limits).
- [i.5] IEEE 802.3ah: "IEEE Standard for Information Technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier Sense Multiple Access With Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Amendment: Media Access Control Parameters, Physical Layers, and Management Parameters for Subscriber Access Networks".
- [i.6] IETF RFC 2684: "Multiprotocol Encapsulation over ATM Adaptation Layer 5".
- [i.7] IEEE 802.1p: "Standard for Local and Metropolitan Area Networks - Supplement to Media Access Control (MAC) Bridges: Traffic Class Expediting and Dynamic Multicast Filtering".
- [i.8] ISO/IEC 8802-3: "Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications".
- [i.9] IEEE 802.1ag: "IEEE Standard for Local and Metropolitan Area Networks Virtual Bridged Local Area Networks Amendment 5: Connectivity Fault Management".
- [i.10] ITU-T Recommendation G.984 (all parts): "Gigabit-capable Passive Optical Networks (GPON)".
- [i.11] IEEE 802.1q: "IEEE Standard for Local and Metropolitan Area Networks - Virtual Bridged Local Area Networks".
- [i.12] ITU-T Recommendation K.21: "Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents".
- [i.13] ITU-T Recommendation K.44: "Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents - Basic Recommendation".
- [i.14] ITU-T Recommendation G.992.1: "Asymmetric digital subscriber line (ADSL) transceivers".
- [i.15] ITU-T Recommendation G.992.3: "Asymmetric digital subscriber line transceivers 2 (ADSL2)".
- [i.16] ITU-T Recommendation G.992.5: "Asymmetric Digital Subscriber Line (ADSL) transceivers - Extended bandwidth ADSL2 (ADSL2plus)".
- [i.17] ITU-T Recommendation G.997.1: "Physical layer management for digital subscriber line (DSL) transceivers".

- [i.18] ITU-T Recommendation G.994.1: "Handshake procedures for digital subscriber line (DSL) transceivers".
- [i.19] ITU-T Recommendation G.993.2: "Very high speed digital subscriber line transceivers 2 (VDSL2)".
- [i.20] ITU-T Recommendation I.361: "B-ISDN ATM layer specification".
- [i.21] ITU-T Recommendation I.365: "B-ISDN ATM adaptation layer sublayers".
- [i.22] DSL Forum WT-115: "G.VDSL2 Functionality Test Plan".
- [i.23] DSL Forum TR-067: "ADSL Interoperability Test Plan".
- [i.24] DSL Forum TR-100: "ADSL2/ADSL2plus Performance Test Plan".
- [i.25] DSL Forum WT-105: "G.992.3/5 ADSL2/ADSL2plus Functionality Test Plan".
- [i.26] DSL Forum WT-114: "G.VDSL2 Performance Test Plan".
- [i.27] DSL Forum WT-107: "Internet Gateway Device Data Model Version 2" (includes bonded DSL).
- [i.28] DSL Forum TR-098: "DSLHome™ Internet Gateway Device Version 1.1 Data Model for TR-069".
- [i.29] DSL Forum TR-069: "CPE WAN Management Protocol".
- [i.30] DSL Forum PD-128: "Test Plan for TR-069 Plugfests".
- [i.31] SFF-8472: "Specification for Diagnostic Monitoring Interface for Optical Transceivers".

NOTE: Available at: <ftp://ftp.seagate.com/sff/SFF-8472.PDF>.

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ADSL	Asymmetric Digital Subscriber Line
AES	Advanced Encryption Standard
AN	Access Network
ANP	Access Network Provider
ATM	Asynchronous Transfer Mode
BER	Bit Error Rate
BSP	Broadband Service Provider
CBR	Constant Bit Rate
CO	Central Office
CoS	Class of Service
CPE	Customer Premises Equipment
DBRu	Dynamic Bandwidth Report upstream
DHCP	Dynamic Host Configuration Protocol
DSCP	DiffServ Code Point
DSLAM	Digital Subscriber Line Access Multiplexer
EFM	Ethernet in the First Mile
EMC	Electric Magnetic Compatibility
FE	Fast Ethernet
FEC	Forward Error Correction
FTTH	Fiber To The Home
FTU	Fiber Termination Unit
FXS	Foreign eXchange Station
GEM	G-PON Encapsulation Method
GPON	Gigabit Passive Optical Network
ID	Identifier
IGMP	Internet Group Management Protocol